REMARKS

Claims 1-4, 11, 13-15, 17, 18, and 29 have been amended. In addition, claims 12 and 31 have been canceled without prejudice or disclaimer as to the subject matter recited therein. As such, claims 1-11, 13-15, 17-18, 28-30, and 32-37 are currently pending in the case. Further examination and reconsideration of the presently claimed application are respectfully requested.

Section 103 Rejections

Claims 1, 4-11, 28-30, 32, and 35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,630,407 to Keil et al. (hereinafter "Keil"). In addition, various dependent claims were rejected under 35 U.S.C. § 103(a) as being unpatentable over Keil in view of U.S. Patent No. 5,626,775 to Roberts et al. (hereinafter "Roberts"), U.S. Patent No. 6,117,786 to Khajehnouri et al. (hereinafter "Khajehnouri"), and U.S. Patent No. 6,403,484 to Lim et al. (hereinafter as "Lim"). To establish a *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP 2143.03. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed.Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); MPEP 2143.01. The cited art does not teach or suggest each and every limitation of the currently pending claims, some distinctive limitations of which are set forth in more detail below.

The primary reference (Kiel) fails to provide teaching, suggestion or even motivation for a method for etching a stack of layers, comprising an anti-reflective layer, a nitride layer and an underlying layer, where one or more layers in the stack are etched with a different etch chemistry than used for etching other layers in the stack. As previously presented in the Response to Final Office Action Mailed July 23, 2004, before the amendment herein, claim 1 recited in part:

> A method for processing a semiconductor topography, comprising: etching a stack of layers within a single etch chamber, wherein the stack of layers comprises: an anti-reflective layer; a nitride layer arranged beneath and in contact with the antireflective layer; an underlying layer arranged beneath the nitride layer; and wherein said etching a stack of layers comprises etching one or more layers in the stack with a different etch chemistry than used for etching other layers in the stack...

Previously presented independent claims 11 and 29 also recited similar limitations.

Statements in the Office Action admit that "Keil doesn't describe etching one or more layers in the stack with a different etch chemistry than used for etching other layers in the stack" (Office Action, page 2). However, the Office Action states that Keil "suggests to etch the ARC selectively to the under layer including the nitride layer (col. 2, line 5-10)." (Office Action, page 2). Therefore, the Examiner concludes that "[i]t would have been obvious to one skilled in the art to etch the layers in the stack with etch chemistry that is tailored for each layer in order to provide a selectively etching for each layer. This would provide claimed etching one or more layers in the stack with a different etch chemistry than used for etching other layers in the stack." (Office Action, pages 2-3). For at least the reasons set forth below, the Applicants disagree that the teachings actually provided by Keil would motivate one skilled in the art to modify the teachings of Keil to etch one or more layers in the stack with a different etch chemistry than used for etching other layers in the stack as presently claimed.

Keil discloses "[a] semiconductor manufacturing process wherein an organic anti-reflective coating (ARC) is plasma etched with selectivity to an underlying dielectric layer and/or overlying photoresist. The etchant gas is fluorine-free and includes a carbon-containing gas such as CO gas, a nitrogen containing gas such as N_2, an optional oxygen containing gas such as O_2, and an optional inert carrier gas such as Ar." (Keil, Abstract). As described in more detail below, however, the manufacturing process of Keil does not include, and cannot be modified to include, the presently claimed step of etching a stack of layers, where one or more layers in the stack are etched with a different etch chemistry than used for etching other layers in the stack.

The primary objective of Keil is to overcome "a problem associated with etching an ARC layer with fluorine." (Keil, column 3, lines 55-56). For example, Keil discloses that the "use of fluorocarbon gases to generate a protective polymer on ... the etched openings of the ARC can cause profile and uniformity issues due to attack of the underlying layer by the fluorine atoms present in the plasma." (Keil, column 3, lines 56-61). To minimize the attack on underlying dielectric layers during the ARC etch, Kiel uses a fluorine-free, carbon-containing etchant gas (preferably, carbon monoxide, CO), which is chosen for its high selectivity to materials used in dielectric layers (e.g., oxides). The high selectivity of the fluorine-free, carbon-containing etchant gas minimizes CD loss and improves the uniformity and profile of the etch by etching the underlying dielectric layer at a much slower rate than if fluorine-based etchant gases were used in the ARC etch. (*See*, e.g., Keil, column 4, lines 1-25). In one embodiment, Keil discloses the ARC etch chemistry as including a "carbon-containing gas such as CO gas, a nitrogen containing gas such as N_2,

an optional oxygen containing gas such as O_2, and an optional inert carrier gas such as Ar" (Keil, Abstract).

The *only* etch chemistry disclosed by Keil is the ARC etch chemistry mentioned above for use in the ARC etch or "pre-etch" process. Therefore, the Applicants agree that Keil fails to provide explicit teaching for the presently claimed etching process, where one or more layers in the stack are etched with a different etch chemistry than used for etching other layers in the stack.

However, the Applicants disagree with the Examiner's contention that Keil somehow provides suggestion for the present claim limitation, or motivation that would enable one skilled in the art to modify the teachings of Keil to include such a limitation.

Although Keil discloses that the ARC etch chemistry should have a high "selectivity to an overlying photoresist and/or underlying dielectric layer" (Keil, column 2, lines 5-10), Keil does not suggest or provide motivation for changing the etch chemistry used for etching the overlying photoresist layer and/or the underlying dielectric layer. In fact, Keil specifically states that the same etch chemistry used for etching the ARC layer is used for etching at least a portion of the underlying dielectric layer. For example, Keil states that a carbon-containing ARC etch chemistry (e.g., CO) with a high selectivity to the underlying layer is chosen, so that "when the dielectric layer is reached, the dielectric layer is etched at a slower rate than in the case where fluorine containing etchant gases are used" for etching the ARC layer. (*See*, Keil, column 4, lines 15-25).

On page 2 of the Office Action, the Examiner appears to suggest that because the ARC etch chemistry of Keil is highly selective to layer(s) underlying the ARC layer, one skilled in the art would necessarily be motivated to use a different etch chemistry for each layer in the stack. This is an incorrect assumption. As noted above, Keil uses a carbon-containing ARC etch chemistry for etching the ARC layer so that, when the underlying dielectric layer is reached, the underlying dielectric layer is etched at a slower etch rate than if a fluorine-containing ARC etch chemistry were used. Because Keil reduces the etch rate of an underlying dielectric layer using a single etch chemistry, and fails to even suggest a desirability for using a different etch chemistry for etching the underlying dielectric layer, Keil provides absolutely no motivation that would enable one skilled in the art to modify the teachings of Keil accordingly.

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination [or modification]. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); MPEP 2143.01. Applicants assert that because Keil fails to provide teaching, suggestion or even a desirability for the above-mentioned limitations of present claims 1, 11, and 29, Keil cannot be modified to do so.

Keil fails to provide teaching, suggestion or motivation for a method for etching a stack of layers (an anti-reflective layer, a nitride layer and an underlying layer), where the stack of layers are etched within a single etch chamber configured for etching a material comprising silicon. Currently amended claim 1 recites in part:

> A method for processing a semiconductor topography, comprising: etching a stack of layers within a single etch chamber, wherein the single etch chamber is configured for etching a material comprising silicon, and wherein the stack of layers comprises: an anti-reflective layer; a nitride layer arranged beneath and in contact with the antireflective layer; an underlying layer arranged beneath the nitride layer...

Currently amended independent claims 11 and 29 also recite similar limitations. As such, each of the independent claims have been amended to include a further limitation, which states that the stack of layers are etched within a single etch chamber, and more specifically, an etch chamber configured for etching a material comprising silicon. Support for the amendments made to claims 1, 11 and 29 may be found in the Specification, e.g., on page 2, lines 1-24; page 3, lines 13-24; page 4, line 19 to page 5, line 19; page 12, lines 12-23.

Keil fails to teach, suggest or provide motivation for etching the stack of layers within a single etch chamber, where the etch chamber is configured for etching a material comprising silicon. Instead, Keil specifically teaches that the stack of layers are etched within an "oxide etch system", or in other words, an etch chamber configured for etching a material comprising oxygen. (*See*, e.g., Keil, column 4, lines 26-38). As noted in the Specification (*See*, e.g., page 2, lines 1-19), "oxide etch tools" are substantially different from "silicon etch tools." For example, oxide etch tools are generally used to produce high density plasmas (a fact corroborated by Keil in column 7, lines 7-60), whereas silicon etch tools are generally used for producing low density plasmas. In addition, silicon etch tools tend to produce a higher number of defects than oxide etch tools.

Keil only provides teaching for an "oxide etch system" and fails to even suggest that the stack of layers may be etched in a silicon etch tool. As such, Keil fails to provide teaching or suggestion for yet another limitation of present claims 1, 11, and 29.

Keil fails to provide teaching, suggestion or motivation for a method for introducing a first noble gas and a second noble gas, each heavier than helium, into the etch chamber during said etching of a stack of layers (an anti-reflective layer, a nitride layer and an underlying layer), where the first and second noble gases differ from one another, and where each noble gas is introduced for assisting the etching of a different layer in the stack of layers. Amended independent claim 1 recites in part:

> A method for processing a semiconductor topography, comprising: etching a stack of layers within a single etch chamber... wherein the stack of layers comprises an anti-reflective layer; a nitride layer arranged beneath and in contact with the antireflective layer; an underlying layer arranged beneath the nitride layer... and introducing a first noble gas and a second noble gas, each heavier than helium, into said etch chamber during said etching, wherein the first and second noble gases differ from one another, and wherein each noble gas is introduced for assisting the etching of a different layer in the stack of layers.

Amended independent claims 11 and 29 recite similar limitations. As such, each of the independent claims have been amended to include yet a further limitation by introducing a first and second noble gas into the etch chamber during the step of etching for assisting the etch process. In accordance with one embodiment of the invention, the first and second noble gases may differ from one another, so that one or more layers in the stack are etched with a different noble gas than used for etching other layers in the stack. Support for the amendments made to claims 1, 11, and 29 may be found in the present specification, e.g., on page 13, line 7 to page 14, line 10.

Keil discloses that the ARC etch rate may be increased by adding an inert carrier gas to the ARC etch chemistry. *See*, e.g., Keil, column 4, lines 10-14 and column 8, lines 39-49. However, the only inert carrier gas mentioned in Keil is argon. In addition, Keil fails to teach or suggest that another inert carrier gas -- other than argon -- may be introduced into the etch chamber for etching a different layer in the stack. In other words, Keil fails to provide teaching or suggestion for introducing a first noble gas and a second noble gas, each heavier than helium, into said etch chamber during said etching, wherein the first and second noble gases differ from one another, and wherein each noble gas is introduced for assisting the etching of a different layer in the stack of layers. Accordingly, fails to provide teaching or suggestion for yet another limitation of present claims 1, 11, and 29.

For at least the reasons stated above, Keil simply fails to provide teaching, suggestion, or motivation for all limitations of independent claims 1, 11, and 29. Furthermore, Keil cannot be modified to do so. Therefore, claims 1, 11, 29, as well as claims dependent therefrom, are asserted to be patentably distinct over Keil. It is noted that the secondary references to Roberts, Khajehnouri, and Lim are not cited for teaching the limitations of independent claims 1, 11, and 29. Accordingly, Applicants respectfully request removal of this rejection.

CONCLUSION

This response constitutes a complete response to all issues raised in the Office Action mailed May 2, 2005. In view of the remarks herein traversing the rejections, Applicants assert that pending claims 1-11, 13-15, 17-18, 28-30 and 32-37 are in condition for allowance. If the Examiner has any questions, comments, or suggestions, the undersigned attorney earnestly requests a telephone conference.

No fees are required for filing this amendment; however, the Commissioner is authorized to charge any additional fees, which may be required, or credit any overpayment, to Daffer McDaniel LLP, Deposit Account No. 50-3268/5298-06900.

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